The Saudi Journal for Dental Research (2016) 7, 127–131

King Saud University

The Saudi Journal for Dental Research

www.ksu.edu.sa
www.sciencedirect.com

ORIGINAL ARTICLE

The risk of acquiring hepatitis B and C viral infections following tooth extraction in Al Farsha area, south-western Saudi Arabia

Suliman M. Al Humayed *

Department of Internal Medicine, College of Medicine, King Khalid University, Abha, Saudi Arabia

Received 30 September 2015; revised 2 May 2016; accepted 3 May 2016
Available online 11 May 2016

KEYWORDS

Tooth extraction;
HBV;
HCV;
Al Farsha Aseer

Abstract The objective of this work was to study tooth extraction as a potential risk factor for the seroprevalence of HBV and HCV infections and other related risk factors in Al Farsha area (a low deprived area), south western Saudi Arabia. Patients and their relatives attending the outpatients' clinics of Al Farsha hospital and relevant primary health care centers were included. A comprehensive questionnaire interview was offered to all participants. Blood samples were taken and tested for HBsAg and HCV antibodies. The present study included 395 persons. Sero-prevalence of HBV and HCV amounted to 15.2% and 2%, respectively. Tooth extraction was found to be a significant risk factor in the transmission of both HBV and HCV infections (aOR = 2.363, aOR = 3.253, respectively). Persons lacking hepatitis B vaccination were also at a higher risk of acquiring HBV infection. There is an urgent need to introduce effective health education campaign and catch-up vaccination against HBV infection in the region. Infection-control education programs tailored to the need of the local health force should be promptly provided. Furthermore, curricula of the local dental colleges must be reviewed to introduce, at an early stage, infection control preventive measures in order to interrupt the transmission of blood-borne infections in general.

1. Introduction

Hepatitis B virus (HBV) infection was hyper-endemic in the Kingdom of Saudi Arabia.[1] The highest endemicity of more than 8% has been reported in the southern region of the Kingdom.[2] Consequently, the ministry of health undertook mass HBV vaccination in 1989 in the southern region and in 1990, the vaccine was included in the Saudi Expanded Programme of Immunization (EPI).[3] Subsequent studies undertaken in the southern region have documented a steady significant decline of HBV infection.[1,4] Horizontal transmission of HBV

* Address: Department of Internal Medicine, College of Medicine, King Khalid University, P.O. Box 641, Abha, Saudi Arabia. Mobile: +966 505490958.
E-mail address: s_humayed@yahoo.com
Peer review under responsibility of King Saud University.

Production and hosting by Elsevier

http://dx.doi.org/10.1016/j.sjdr.2016.05.001

could be a risk of acquiring HBV infection in a dentistry setting especially during tooth extraction. Dentists are at an increased risk of exposure to HBV and likewise their patients. Studies have shown that the risk of exposure for general dentists is about three to four times greater, and for non-immunised surgical specialists about six times greater than that of the general population.[5,6]

Hepatitis C virus (HCV) prevalence in Saudi Arabia varies in different provinces being the highest (1.9%) in the western and the southern provinces.[7] A mean rate of 124 hepatitis C virus (HCV) infected individuals per 100,000 population was observed, accompanied with a slight steady increase during the eleven year period 1995–2005, followed by a plateau. The universal prevalence of HCV infection in the general population ranged from 1.1% to 1.7%.[8] Since HCV infection like HBV infection is blood borne and for which no vaccine is yet available, it is expected that patients attending dentistry setting for tooth extraction are at a special risk of acquiring HCV infection.

During the first week of April 2013, a community service campaign was launched by King Khalid University in Al Farsha area (a low deprived area) of Sarat Ebeida Governorate in Aseer region, south western Saudi Arabia. The campaign targeted relevant health and educational issues in the area.

The objective of this work was to study tooth extraction as a potential risk factor for the seroprevalence of HBV and HCV infections and other related risk factors in Al Farsha area, south western Saudi Arabia.

2. Materials and methods

2.1. Settings

Cross-sectional design was used in the present work. The study enrolled a representative sample of males and females in Al Farsha area, South-western Saudi Arabia.

2.2. The study area

Al Farsha area lies to the westward of Sarat Ebeida governorate in Aseer region. It is few kilometers from neighboring Yemen. Health services delivery in the area is provided by 4 primary health care centers (Al Farsha, Al Ghayel, Wady-Al Hiaya and Al Raboua) and a 50 bed hospital (Al Farsha hospital). The climate is hot and humid most of the year. The majority of inhabitants works as farmers and raise domestic animals for a livelihood.

2.3. Sampling procedure

During the first week of April 2013, patients and their relatives attending the outpatients' clinics of Al Farsha Hospital and relevant primary health care centers in the study area for any reason (attending clinics, doing any laboratory investigation, blood donation and pre-marital screening) were included.

2.4. Questionnaire interview

Data were collected from all participants using a structured questionnaire interview. The questionnaire incorporated socio-demographic data and history of relevant exposures. History of blood transfusion was inquired about. Similarly, the following data were collected: history of surgical operations, tooth extraction, wet cupping and hepatitis B vaccination.

2.5. Ethical approval

The ethical committee of King Khalid University reviewed and approved the protocol of the study as designed. Informed consents were taken from each individual (or guardians for children).

2.6. Blood sampling

A total of 5–10 ml venous blood samples were withdrawn from each participant. Separated sera were divided into two portions and transported in ice boxes to the Virus Lab of Abha College of Medicine, where they were stored at −20 °C until tested.

2.7. Serologic tests for HBsAg

HBsAg was tested by a fourth generation enzyme immunoassay (ELISA) obtained from DIA.PRO Diagnostic Bioprobes Sr1 Via G. Carducci, Milano, Italy. Briefly, the solid phase was precoated with mouse monoclonal antibodies specific to the sub determinants *a*, *d* and *y*. Test sera were reacted with these antibodies, incubated and washed. The captured HBsAg was further reacted with conjugated mouse monoclonal antibodies against those sub determinants. Test plates were subsequently washed and reacted with a substrate. The resulting color was read by a double beam multiscan ELISA reader at 450 nm. The manufacturer' protocols were strictly followed in testing and interpreting the results.[9]

2.8. Serologic testing for HCV

Detection of ant-HCV antibodies was done utilizing fourth-generation ELISA. Kits were obtained from DIA.PRO Diagnostic Bioprobes Sr1 Via G. Carducci, Milano, Italy. The assay detects IgG class antibodies against the viral structural protein c-22-3 derived from the genomic core region and three non-structural proteins c-33c, c100-3 and 5-1-1 derived from the NS3 and NS4 regions of the viral genome. The manufacturer's protocols were strictly followed in testing and interpreting the results. All positive and equivocal HCV serology results were further confirmed by RT-PCR.[9]

2.9. Statistical analysis

Data were fed in a computer and analyzed using the Statistical Package for the Social Sciences (SPSS), version 13.0 (SPSS Inc., Chicago, IL, USA). Chi square test and Fishers' Exact tests were used as tests of significance at a 5% level of significance. Binary logistic multivariate analysis, adjusted odds ratio and antecedent 95% CIs were used to identify potential risk factors for HBsAg and HCV seropsoitivity.

Table 1 Distribution of the study sample (395) in Al Farsha area, southwestern Saudi Arabia by demographic data and relevant exposures.

	Variable	Number	%
Age	Less than 20 years old	101	25.6
	20+ years old	294	74.4
Gender	Males	206	52.2
	Females	189	47.8
Education	Illiterates	174	44.1
	Primary	104	26.3
	Intermediate	43	10.9
	Secondary	53	13.4
	University	21	5.4
History	Blood transfusion	58	14.7
	Surgical operation	97	24.6
	Tooth extraction	118	29.9
	Wet cupping	41	10.4
	Hepatitis B vaccination	63	15.9

3. Results

3.1. Demographic data and relevant exposures

The present study included 395 persons (Table 1) in Al Farsha area, south-western Saudi Arabia. Their age ranged from 7 to 78 years with an average of 32.6 ± 7.4 years and a median of 32 years. The table shows that 25.6% (101) of the study sample were aged less than 20 years. There were 206 males (52.2%) and 189 females (47.8%). Regarding level of education, illiteracy rate amounted to 44.1%. History of blood transfusion amounted to 14.7%. Similarly, a history of surgical operations and a history of tooth extraction amounted to 24.6% and 29.9%, respectively. On the other hand, a history of hepatitis B vaccination was reported by only 15.9%.

3.2. Sero-prevalence of hepatitis B (HBsAg) and hepatitis C

The present study showed that 60 persons and 8 persons were positive for hepatitis B surface antigen and HCV, respectively, giving a sero-prevalence of 15.2% and 2.0%, respectively. One case had HBV and HCV co-infection (0.2%). The prevalence of HBV infection amounted to 18.7% among persons aged 20 years and above compared to 5% among persons aged less than 20 years.

3.3. Determinants of HBsAg sero-positivity

Multivariate binary logistic regression analysis was used to identify potential risk factors associated with HBsAg sero-positivity (Table 2). After adjusting for other potential risk factors, the study showed that persons with a history of teeth extraction had more than two times the risk to become sero-positive for HBsAg (aOR = 2.363, 95% CI: 1.102–5.065). Similarly, persons lacking hepatitis B vaccination had more than six times the risk to become sero-positive for HBsAg (aOR = 6.852, 95% CI: 1.614–9.092). On the other hand, history of other exposures was found to be of no significance in developing sero-positive HBsAg.

3.4. Determinants of HCV sero-positivity

Table 3 shows that after adjusting for other potential risk factors, persons with a history of teeth extraction had more than three times the risk to become sero-positive for HCV (aOR = 3.253, 95% CI: 1.049–8.774). On the other hand,

Table 2 Multivariate analysis, adjusted odds ratio (aOR) and antecedent 95% confidence intervals (CI) of potential risk factors determining sero-positive HBsAg in Al Farsha area Aseer, southwestern Saudi Arabia.

Variable	aOR	95% CI	
		Lower	Upper
History of blood transfusion*: Yes vs. No	1.479	0.793	2.759
History of any surgical operation : Yes vs. No	1.325	0.144	1.735
***History of tooth extraction: Yes vs. No**	**2.363**	**1.102**	**5.065**
History of wet Cupping : Yes vs. No	1.092	0.450	2.651
***History of hepatitis B vaccination*: No vs. Yes**	**6.852**	1.614	**9.092**

* Significant ($P < 0.05$).

Table 3 Multivariate analysis, adjusted odds ratio (aOR) and antecedent 95% confidence intervals (CI) of potential risk factors determining sero-positive HCV in Al Farsha Area Aseer, southwestern Saudi Arabia.

Variable	aOR	95% CI	
		Lower	Upper
History of blood transfusion: Yes vs. No	0.493	0.080	3.034
History of any surgical operation : Yes vs. No	0.179	0.019	1.691
***History of Tooth Extraction: Yes vs. No**	**3.253**	**1.049**	**8.774**
History of wet cupping : Yes vs. No	3.538	0.548	22.831

* Significant ($P < 0.05$).

other exposures were found to be of no significance in developing sero-positive HCV.

4. Discussion

The present study documented the high prevalence rate of 15.2% of HBV infection among the population of Al-Farsha. This might be partly explained by the low history of previous HBV vaccination and thus the majority (84.1%) were not vaccinated. In fact, the high rate of HBV infection found in this study is almost identical to that found among the population of the southern and western regions prior to the introduction of mass vaccination in 1989.[1] In that year, complete HBV vaccination in the region was 90%.[3] Some pockets in Al-Farsha might not have been covered because of the rugged mountainous nature of terrain. Some localities around Al-Farsha are only accessible by foot or by animals. The infection rate in the present study among those above the age of 20 years (18.7%) who missed the compulsory HBV vaccination was higher than the younger group (5%). Furthermore, the general awareness of the population regarding blood-borne infections is low because of the high illiteracy rate (44.1%) documented in the study. Indeed, lack of vaccination, which was also found to be a significant risk factor, rendered such individuals more prone to HBV infection.

Interestingly too, this study confirms the high prevalence of HCV infection in this area of 2%. Similar study in 2004 showed that the highest prevalence of HCV infection (1.9%) was reported in the south and western regions of Saudi Arabia.[7]

The questionnaire used in the present study entailed inquiring the interviewed person regarding the history of tooth extraction. Such an incident is not subject to recall bias since tooth extraction is difficult to forget. A single incident of exposure to tooth extraction could render the subject prone to acquire HBV and/or HCV infection. This fact is not a cumulative exposure and therefore there was no need to further inquire about the number and frequency of tooth extractions performed in the past.

In this study, tooth extraction was found to be a common denominator risk factor in the transmission of both HBV and HCV infections. Regarding HBV infection, studies from Turkey, Iran, China, Pakistan, and Nigeria[10–14] showed no significant association between invasive dental procedures including tooth extraction and HBV infection. A recent study from India in 2011[15], however, documented a relation between invasive dental procedures and HBV infection. In 2013 Mahboobi et al. concluded in their extensive review that dental treatment acts as a risk factor for acquiring both HBV and HCV and that it could be easily be eliminated using standard precautionary measures.[16]

The present study also documented a significant association between HCV infection and tooth extraction. Many studies support this finding: Studies from Turkey revealed that frequent tooth extraction and dental treatment were significantly associated with HCV infection.[17,18] A recent study in 2014 in Malaysia concluded that dental extraction acted as a risk factor for acquiring HCV and that complete sterilization and cleaning of equipment was necessary.[19] Studies from Egypt[20] and on immigrants from the Soviet Union to occupied Palestinian Land[21] and Madagascar[22] have also documented this association. On the other hand, studies from USA, Australia, France, did not demonstrate this association.[23–25] In the developed world, compliance with infection control procedures and health perception plays a crucial role in the prevention of transmission of blood-borne infection.[26]

Dental procedures often result in bleeding and exposure to infected body fluids that are known vehicles of infectious disease transmission. The use of barrier techniques has been documented to be important in preventing the common routes of transmission such as dentist to patient, patient to dentist and patient to patient in dental settings. Procedures such as tooth extractions without proper infection control measures could be potentially life-threatening for health care workers and patients.[26] Exposure to more intensive and varying types of infection-control education were documented as possible reasons for better compliance among oral health-care practitioners.[27]

In the present study the dental clinics in Al Farsha included only one dentist and one assistant. Literature review reported that the size of facilities played a role in compliance with infection control. The larger facilities, employing nine or more oral health-care practitioners and other personnel, were more likely to have implemented guidelines and also to have more knowledge to comply with infection control when compared with solo or smaller facilities.[27]

Studies in the southern region showed that dental students (potential dental workforce in the future in the region) lacked proper knowledge about infection control and more than two thirds of them are not protected against hepatitis B infection.[28,29] With the high endemic rate of HBV and HCV infections in the region, dental health workers are at high risk of contracting both infections.

5. Conclusion

The findings from Al-Farsha call for an urgent intervention both from the ministry of health to target remote and isolated localities in the southern region of the Kingdom to introduce effective health education campaign and catch-up vaccination against HBV infection.

Dental health care providers in such localities must strictly adhere to the infection control measures and guidelines. More intensive and varying infection-control education programs tailored to the need of the local health force should be promptly provided. Furthermore, curricula of the local dental colleges must be reviewed and to introduce, at an early stage, infection control preventive measures in order to interrupt the transmission of blood-borne infections in general.

Conflict of interest

The author declares no conflict of interest.

Acknowledgements

This work was funded by Roche, Saudi Arabia. The sponsor has no role in the study design; in the collection, analysis and interpretation of data; in the writing of the report; or in the decision to submit the article for publication. The author wishes to extend his thanks and appreciation for King Khalid University Community Service Campaign at Al Farsha for the

support during this study. Votes of thanks go to the Director of Al Farsha Hospital and Primary Health Care Centers. The author cordially acknowledges the full participation of Medical Students sharing in the campaign. The meticulous and the skillful technical and administrative assistance of Mr. Riyad Eisa and Mr. Ossama Al Kadoumy of King Khalid University is highly appreciated. The advice and revisions of Dr. Awad El Mekki, Professor of clinical virology and Dr. Ahmed Mahfouz, Professor of Epidemiology are highly valued.

References

1. Abdo AA, Sanai FM, Al-Faleh FZ. Epidemiology of viral hepatitis in saudi arabia: are we off the hook? *Saudi J Gastroenterol* 2012;**18**(6):349–57.
2. Al-Faleh FZ. Changing pattern of hepatitis viral infection in Saudi Arabia in the last two decades. *Ann Saudi Med* 2003;**23**(6):367–71.
3. Al-Faleh FZ, Ayoola EA, Al-Jeffry M, Arif M, Al-Rashed RS, Ramia S. Integration of hepatitis B vaccine into the expanded program on immunization: the Saudi Arabian experience. *Ann Saudi Med* 1993;**13**(3):231–6.
4. Ayoola AE, Tobaigy MS, Gadour MO, Ahmed BS, Hamza MK, Ageel AM. The decline of hepatitis B viral infection in south-western Saudi Arabia. *Saudi Med J* 2003;**24**(9):991–5.
5. Polakoff S, Tillet HE. Acute viral hepatitis B: laboratory reports 1975–9. *Br Dent J* 1982;**284**(6332):1881–2.
6. Cottone JA, Molinari JA. Hepatitis B vaccine: an update. *J Calif Dent Assoc* 1989;**17**(2):11–2.
7. Akbar HO. Hepatitis C virus infection in Saudi Arabia. *Saudi J Gastroenterol* 2004;**10**(3):127–31.
8. Madani TA. Hepatitis C virus infections reported over 11 years of surveillance in Saudi Arabia. *Trans R Soc Trop Med Hyg* 2009;**103**(2):132–6.
9. Ip S, Ford JA, Lau K, Marquez V, Guan M, Klassen C, Chan J, Kwan WP, Krajden M, Yoshida EM. Seroprevalences of hepatitis B virus and hepatitis C virus among participants of an Asian health fair in the lower Mainland, British Columbia. *Can J Infect Dis Med Microbiol* 2015 Jul-Aug;**26**(4):196–200.
10. Otkun M, Erdogan MS, Tatman-Otkun M, Akata F. Exposure time to hepatitis B virus and associated risk factors among children in Edirne, Turkey. *Epidemiol Infect* 2005;**133**(3):509–16.
11. Pourshams A, Nasiri J, Mohammadkhani A, Nasrollahzadeh D. Hepatitis B in Gonbad-e-Kavoos: prevalence, risk factors and intrafamilial spreading. *Govaresh* 2004;**9**:222–5.
12. Zhang HW, Yin JH, Li YT, Li CZ, Ren H, Gu CY, et al. Risk factors for acute hepatitis B and its progression to chronic hepatitis in Shanghai, China. *Gut* 2008;**57**(12):1713–20.
13. Aziz S, Muzaffar R, Hafiz S, Abbas Z, Zafar MN, Nagvi SA, et al. Helicobacter pylori, hepatitis viruses A, C, E, antibodies and HBsAg – prevalence and associated risk factors in pediatric communities of Karachi. *J Coll Physicians Surg Pak* 2007;**17**(4):195–8.
14. Ugbebor O, Aigbirior M, Osazuwa F, Enabudoso E, Zabayo O. The prevalence of hepatitis B and C viral infections among pregnant women. *N Am J Med Sci* 2011;**3**:238–41.
15. Pande C, Sarin S, Patra S, Bhutia K, Mishra S, Pahua S, Jain M, Srivastava S, Dar S, Trividi S, Makhopadhyay C, Kumar A. Prevalence, risk factors and virological profile of chronic hepatitis B infection in pregnant women in India. *J Med Virol* 2011;**83**:962–7.
16. Mahboobi N, Porter SR, Karayiannis P, Alavian S. Dental treatment as a risk factor for hepatitis B and C viral infection. A review of the recent literature. *J Gastrointestin Liver Dis* 2013;**22**(1):79–86.
17. Yildirim B, Tahan V, Ozaras R, Aytekin H, Mert A, Tabak F, et al. Hepatitis C virus risk factors in the Turkish community. *Dig Dis Sci* 2005;**50**:2352–5.
18. Karaca C, Cakaloglu Y, Demir K, Ozdil S, Kaymalkoglu S, Badur S, et al. Risk factors for the transmission of hepatitis C virus infection in the Turkish population. *Dig Dis Sci* 2006;**51**:365–9.
19. Al-Kubaisy W, Al-Naggar R, Shamsidah N, Bobryshev Y, Al-Kubaisy M. Is dental extraction a risk factor for contracting HCV infection: Abs, RNA and genotype detection. *Oral Biol Dent* 2014;**2**:7.
20. Esmat G, Hashem M, El-Raziky M, El-Akel W, El-Naghy S, El-Koofy N, et al. Risk factors for hepatitis C virus acquisition and predictors of persistence among Egyptian children. *Liver Int* 2012;**32**:449–56.
21. Kerzman H, Green MS, Shinar E. Risk factors for hepatitis C virus infection among blood donors in Israel: a case-control study between native Israelis and immigrants from the former Soviet Union. *Transfusion* 2007;**47**:1189–96.
22. Ramarokoto CE, Rakotomanana F, Ratsitorahina M, et al. Seroprevalence of hepatitis C and associated risk factors in urban areas of Antananarivo, Madagascar. *BMC Infect Dis* 2008;**8**:25.
23. Murphy EL, Bryzman SM, Glynn SA, et al. Risk factors for hepatitis C virus infection in United States blood donors. NHLBI retrovirus epidemiology donor study (REDS). *Hepatology* 2000;**31**:756–62.
24. Trasancos CC, Kainer MA, Desmond PV, Kelly H. Investigation of potential iatrogenic transmission of hepatitis C in Victoria, Australia. *Aust N Z J Public Health* 2001;**25**:241–4.
25. Karmochkine M, Carrat F, Dos Santos O, Cacoub P, Raguin G. A case control study of risk factors for hepatitis C infection in patients with unexplained routes of infection. *J Viral Hepat* 2006;**13**:775–82.
26. Oosthuysen J, Potgieter E, Fossey A. Compliance with infection prevention and control in oral health-care facilities: a global perspective. *Int Dent J* 2014;**64**(297–311):26.
27. Cleveland J, Foster M, Barker L, et al. Advancing infection control in dental care settings: factors associated with dentists' implementation of guidelines from the centers for disease control and prevention. *J Am Dent Assoc* 2012;**143**:1127–38.
28. Bin Ali A, Al-Azraqi T, Al-Fifi S, Al-Humayed S, El Mekki A, Mahfouz A. Hepatitis B virus infection among Health Colleges' students in the Aseer region, Southwestern Saudi Arabia. *Med J Cairo Univ* 2014;**82**(1):89–93.
29. Alqahtani J, Abu-Eshy S, Mahfouz A, El-Mekki A, Asaad A. Seroprevalence of hepatitis B and C virus infections among health students and health care workers in the Najran region, south-western Saudi Arabia: the need for national guidelines for health students. *BMC Public Health* 2014;**14**:577.